

REMARKS

Claims 15, 16, 19 and 32-41 stand rejected under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglemaier et al. (U.S. Patent No. 6,732,507) in view of Stroia et al (U.S. Patent No. 6,745,560) and Bromberg et al. (U.S. 6,560,958). Applicants disagree.

Applicants' exhaust gas after treatment device ("EGAD") is configured such that the entire engine exhaust gas stream is subjected to a reforming process. The combination of Stanglmaier et al., Stroia et al. and Bromberg et al. fails to teach or suggest such an EGAD.

Stanglmaier et al. disclose EGAD comprising in this order: a particulate filter, a NOx storage catalytic converter (NSC or LNT) and an SCR catalytic converter. Ammonia that has been generated during regeneration of the NSC with rich (reducing) exhaust gas within the NSC is used by the SCR catalytic converter to further reduce NOx emissions. However, the EGAD of Stanglmaier et al. does not contain a reforming unit nor does it contain an exhaust gas recirculation (EGR) downstream of the reforming unit. Stanglmaier also does not disclose a catalyst downstream the SCR catalytic converter (claim 16) or arranged close to the engine (claim 38). Furthermore no secondary injection device (claim 41) is included.

In addition, although Stanglmaier et al. makes a single mention of an exhaust gas recirculation, i.e., ". . . the aftertreatment system may include exhaust gas recirculation and/or other emission control schemes or devices to reduce exhaust gas emissions" (Col. 5, lines 33-35), Stanglmaier et al. does not suggest where in the EGAD the EGR might be positioned. Applicant's note that a so called high pressure EGR was prevalent at the time of filing but only branching off from the exhaust manifold, as illustrated by Bromberg et al.

Stroia et al. describes in its most relevant embodiments, Fig. 4 or Fig. 5, an EGAD partly configured as a “two leg” system. In each leg a particulate filter is arranged upstream of an NSC and a secondary injection unit is arranged upstream of the particulate filter. An oxidation catalytic converter can be arranged downstream of where the legs reconnect. Furthermore, while the particulate filter(s) can be catalytically active, thus functioning as a reforming unit for supplying H₂ enriched gas in order to improve the NSC regeneration, Applicants note that no SCR catalytic converter is provided and no ammonia generation by the NSC's is disclosed or suggested. Furthermore Stroia et al. does not teach or suggest an EGR, and therefore does not teach where it should be positioned, nor does Stroia et al. teach or suggest a closed coupled catalyst. Thus Stroia's combination with Stanglmaier et al. does not teach Applicant's EGAD having an EGR in the full exhaust stream.

With respect to Stroia's "reforming unit" Applicants note that because the NSC's are regenerated alternately, the respective particulate filter/reforming of the added fuel is performed on only a part of the engine exhaust gas stream and not in the whole of the main exhaust gas stream, as required by Applicants' claims. Thus combining Stroia's two-legged system with Stanglmaier does not suggest Applicants' claimed invention where the components are all arranged directly in the full flow of exhaust gas, in a main exhaust gas stream, of an internal combustion engine.

Moreover, since it is an essential feature of Stroia at al. to enrich only a minor portion of the exhaust gas (see col. 2, I. 37-43; col. 6, I. 53-57), Stroia at al. combined with Stanglmaier also teaches away from claim 41 wherein a secondary injection device is arranged upstream of the reforming unit for introducing reducing agents to the full exhaust stream, and as a consequence the ordinary person of skill in the art would not combine Stroia at al. and Stanglmaier at al.

In Stroia's Fig. 1 or Fig. 2, where the particulate filter is arranged in the main exhaust gas stream upstream of the NSC parallel arrangement, the particulate filter does not function as a reforming unit because fuel that might be reformed is added downstream of the particulate filter.

The combination of Stanglmaier and Stroia with the newly cited reference, Bromberg et al., also does not teach or suggest the invention because Bromberg et al. relates to an EGAD with an NSC and a reformer unit for providing H₂ rich gas in order to improve NSC regeneration. While an EGR may be disclosed, the EGR line branches off from the main exhaust gas line downstream of the NSC. Likewise, the reformer unit of Blomberg et al. is also arranged in a side stream with a separate supply of oxygen, steam and fuel and not in the full flow of the engine exhaust stream. Thus, the combination of Bromberg et al. with Stanglmaier et al. and Stroia et al. does not teach or suggest arranging the EGR and a reforming unit in the main exhaust stream.

The foregoing remarks demonstrate that none of the documents, alone or combined, teach or suggest a (single) reforming unit and an EGR in a full flow of engine exhaust gas. Therefore, none of the documents teach or suggest an EGAD which provides for reforming of the whole exhaust gas stream. Thus the combination of the cited references does not lead one of skill in the art to the invention as claimed. Applicant requests that the Examiner reconsider and withdraw the rejection of the claims under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglmaier et al. in view of Stroia et al. and Bromberg et al.

Claims 17 and 18 stand rejected under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglemaier et al., in view of Stroia et al. and Bromberg et al., as applied to claims 16 and 15 and further in view of Murachi et al. (U.S. Patent No. 5,746,989). Applicants disagree.

The deficiencies of Stanglmaier et al., Stroia et al. and Bromberg et al. are discussed above. Combining these references with Murachi et al. also fails to teach or suggest the invention as claimed. The Office states that Murachi et al. disclose a system for purifying exhaust gas of an internal combustion engine, comprising a NO_x storage catalytic converter (9) and a three-way catalytic converter (TWC) located upstream of the NO_x storage catalytic converter (9). However, Murachi et al. fails to teach or suggest an EGR arranged downstream of the reforming unit thus one of skill in the art combining Stanglmaier et al., Stroia et al. and Bromberg et al. and Murachi et al. would not be guided to the invention as claimed. Thus the combination of the four references fails to render the invention as claimed obvious.

In view of the foregoing remarks, Applicants request that the Examiner reconsider and withdraw the rejection of the claims under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglmaier et al., in view of Stroia et al. and Bromberg et al. and further in view of Murachi et al.

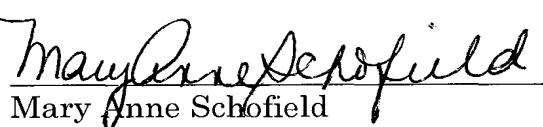
Applicants submit that this application is now in condition for allowance. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

Application No. 10/552,263
Reply
Attorney Docket No. 095309.56876US

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket # 095309.56876US).

Respectfully submitted,

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